REMARKS

Applicants have amended their claims in order to further clarify the definition of the present invention. Specifically, of claims previously in the application, claims 1-5 and 8 have been cancelled without prejudice or disclaimer, leaving method claim 6 as the sole independent claim in the application. Claim 6 is being presently amended to recite that a temperature of a region which forms a side wall of the vacuum processing chamber is controlled to "be in" a range of 10° C - 120° C. Furthermore, claim 10 has been amended to recite a plasma processing "method", rather than a plasma processing apparatus; this amendment of claim 10 is in light of comments by the Board in the Decision mailed September 30, 2004. Moreover, claim 9 has been amended to correct a typographical error therein.

In addition, Applicants are adding new claims 11-16 to the application. Claims 11 and 12, each dependent on claim 6, respectively recites that the temperature of the region which forms the side wall of the vacuum processing chamber is controlled to have a temperature in the range of 30° C - 50° C; and recites that a temperature control accuracy of the side wall, in the step of controlling, is ±5°C. Claim 13, dependent on claim 6, recites that the plasma processing method is an etching method of the sample; and claims 13 and 14, each dependent on claim 15, respectively recites that the sample has an oxide surface and during the etching method the oxide surface is etched, and recites that a distance between electrodes in the plasma processing chamber is 50-100mm. Claim 16 recites the same subject matter as expressly set forth in claim 15, but is dependent on claim 6.

In connection with the presently newly added claims, note, for example, pages 10-12 of Applicants' substitute specification submitted with the Preliminary Amendment filed March 23, 2000, in the above-identified application.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed October 26, 1004, that is, the teachings of the U.S. Patents to Satou, et al No. 5,961,850, to Tokunaga, et al, No. 5,874,013 and to Ohtake, et al, No. 6,054,063, under the provisions of 35 U.S.C. §103.

It is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a plasma processing method as in the present claims, wherein plasma processing is carried out by generating a plasma in response to introduction of a gas which contains at least carbon and fluorine, with a gas species being generated which contains carbon and fluorine according to plasma dissociation, and wherein the method includes effecting plasma generation using an electron cyclotron resonance system in which a microwave having a frequency of from 300MHz to 1GHz is employed and a degree of plasma dissociation is an intermediate degree, and a temperature of a region which forms a side wall of the vacuum processing chamber is controlled to be in a range of 10° C to 120° C (see claim 6), in particular, in a range of 30° - 50° C (see claim 11).

Moreover, it is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a

plasma processing method as in the present claims, having features as discussed previously in connection with claim 6, and, moreover, wherein the plasma generation produces a plasma in which an electron energy is in a range of 0.25eV to 1eV (see claim 7); and/or wherein in the plasma generation, a drive of the plasma exciting power supply is carried out intermittently; and/or wherein as a means for adjusting the temperature of the vacuum side wall, a temperature adjusted coolant medium is used (see claim 10); and/or wherein a temperature control accuracy of the side wall, during the controlling step, is ±5°C (see claim 12); and/or wherein the plasma etching method is an etching method of the sample (see claim 12), with the etching method etching an oxide surface of the sample (see claim 14); and/or wherein a distance between electrodes in the plasma processing chamber is 50-100mm (see claims 15 and 16).

By controlling the temperature of the region which forms the side wall of the vacuum processing chamber to a relatively low temperature of 10°C -120°C, more specifically, 30°-50°C, and particularly with a side wall temperature control accuracy of ±5°C, fluctuation of the etching characteristic can be restrained for a long period of operation. Note the paragraph bridging pages 11 and 12 of Applicants' specification.

Note also the disclosure on page 28, lines 7-17 of Applicants' specification, disclosing that according to the present invention, the side wall temperature is established within a range of 10°C to 120°C; and that with this temperature range, since the etching chamber is not heated to a high temperature there are the additional advantages that the size of the apparatus can be small, and materials used for the vacuum sealing and materials having

a different thermal expansion coefficient can be used freely, and temperature control can be performed easily.

It is respectfully submitted that the present invention, wherein the temperature of the region which forms the side wall of the vacuum processing chamber is controlled as in the present claims, provides unexpectedly better results for the present invention. In this regard, attention is respectfully directed to, for example, Fig. 4 of Applicants' original disclosure, together with the description in connection therewith on pages 29 and 30 of Applicants' substitute specification. As particularly stated in the paragraph bridging pages 29 and 30 of Applicants' substitute specification, since the side wall temperature is low in the Area 1 (a side wall temperature of, e.g., 10° C - 120°C) influence of the deposition film on the side wall, on the etching characteristic is small. Note that in Area 2 in Fig. 4, the deposition film on the side wall is comparatively large and the gas discharge amount is large, and the temperature fluctuation of the side wall has a large influence on the etching characteristic. Note further page 30, lines 9-23 of Applicants' substitute specification.

Note also Fig. 6 and the description in connection therewith on page 31, lines 7-18, of Applicants' substitute specification. As can be seen therein, etching characteristic is stable from the starting time of the etching, with hardly any fluctuation. It is respectfully submitted that the evidence in Applicants' specification as originally filed shows an unexpectedly more stable etching characteristic can be obtained according to the present invention, having a side wall temperature in the range of 10° - 120°C; and, in particular, wherein the temperature adjustment range of the side wall is ±5°C. It is

respectfully submitted that this evidence in Applicants' specification must be considered in determining patentability of the present invention. See In re DeBlauwe, 222 USPQ 191 (CAFC 1984). Properly considered, it is respectfully submitted that this evidence of record clearly overcomes any possible prima facie case of obviousness, and clearly supports a conclusion of unobviousness over the teachings of the applied prior art.

Satou, et al, discloses a plasma processing method, suited for plasma-processing specimens such as semiconductor device substrates. This reference discloses that to prevent abnormal generation of reaction products and ensure high yield of specimens, the locations above the specimen are controlled to a temperature at which the reaction products do not solidify, and the locations below the specimen (lower part of the specimen mount, inner bottom portion of the processing chamber, exhaust pipe, etc.) are controlled to temperatures at which the reaction products solidify. See column 1, lines 41-47. Note also column 1, lines 58-67. This patent discloses temperature control regions for temperature controllers, in Table 1. This patent discloses that the inner side wall portion corresponding to the plasma generation region in the processing chamber 10 is controlled to an elevated temperature of 100°C and more than 10°C to 400°C, while other portions, such as the side surface and lower part of the specimen mount, the inner bottom portion of the processing chamber and exhaust pipe, are cooled at -200°C or more than -200°C to less than 100°C. Note column 3, lines 10-30. According to one feature of Satou et al, after deposits have adhered to lower parts of the apparatus the coolant of the cooled portions is stopped and the cooled portions are then heated to the sublimation temperature of the deposit, and,

as a result of the heating, the deposit adhering to the processing chamber is sublimated. See column 5, lines 33-50. Note also the paragraph bridging columns 5 and 6 of this patent. Note further column 6, lines 34-42.

It is respectfully submitted that Satou, et al, does not disclose, nor would have suggested, generating a plasma using an electron cyclotron resonance system in which a microwave having a frequency of from 300MHz to 1GHz is employed, and/or controlling a temperature of a region which forms a side wall of the vacuum processing chamber to be in a range of 10° - 120°C, and advantages thereof as discussed in the foregoing.

It is emphasized that Satou, et al, discloses the inner side wall portion corresponding to the plasma generation region is heated to an elevated temperature range of 100°C and more than 10°C to 400°C. Clearly Satou, et al, discloses a range up to 400°C, which relatively high temperature above 120°C and up to 200°C would not achieve the advantages of the present invention. In addition, refer to Table 1 in column 3 thereof, and heating of 100°-400°C. It is respectfully submitted that this reference would have clearly taught away from the relatively low temperature for the region which forms the side wall, as in the present invention, and advantages achieved thereby of a stable etching characteristic, as discussed previously.

More particularly, it is respectfully submitted that Satou, et al, would have taught away from the relatively low temperature of 30° - 50°C as in, e.g., claim 11, and advantages thereof.

It is respectfully submitted that the secondary references as applied by the Examiner would not have rectified the deficiencies of Satou, et al, such

that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Tokunaga, et al discloses a method of fabricating semiconductor integrated circuits, including dry-etching a thin film on a semiconductor wafer by radicals or ions in a plasma, wherein desired dissociated species are produced by allowing an inert gas excited to a metastable state in a plasma and a reaction gas necessary for dry-etching a thin film on a semiconductor substrate to interact when dry-etching the thin film. See column 2, lines 23-28. Note also column 3, lines 24-50. See, further, column 7, lines 14-22 and column 8, lines 57-65, as well Table 5 at column 9, lines 1-10.

Even assuming, arguendo, that the teachings of these applied references were properly combinable, such teachings would have neither disclosed nor would have suggested the present invention, including the frequency range of the microwaves and/or other features of the present invention as discussed previously including the control of the temperature of the region forming the side wall of the vacuum processing chamber to be in a range of 10° - 120°C.

The contention by the Examiner that Tokunaga, et al, discloses a microwave frequency in the 300MHz to 1GHz range is noted. It is respectfully submitted, however, that Tokunaga, et al discloses in the Background of the Invention thereof, that relatively high frequency microwaves, of 1-10GHz (ordinarily of 2.45Ghz) generated by a microwave generator are propagated to a wave guide and are introduced into a discharge tube forming a discharge chamber, in forming a plasma. It is respectfully submitted that this disclosure in Tokunaga, et al, of relatively high frequency microwaves, would have

neither taught nor would have suggested use of the relatively low frequency microwaves as in the present invention and problems in achieving stable characteristics when using such microwaves, as described in Applicants' original disclosure; and/or avoiding such problems through the processing as in the present claims, including the control of the temperature of the region forming the side wall of the vacuum processing chamber as discussed previously.

Ohtake, et al, discloses a method for plasma treatment of substrates, which includes treating the surface of a substrate with a plasma generated using a pulse-modulated high-frequency electronic field, the method being described most generally at column 2, lines 43-53. Note also column 2, lines 61-67. Note further column 3, lines 1-3 and 15-18. This patent further discloses that for the plasma treatment described therein, the electron temperature of the plasma during plasma treatment is controlled at 2 eV or lower, and is controlled preferably at 0.5 eV or higher. Note column 5, lines 4-13. See also column 4, lines 14-16.

Even assuming, arguendo, that the teachings of Ohtake, et al were properly combinable with the teachings of Tokunaga, et al and Satou, et al, such combined teachings would have neither disclosed nor would have suggested the presently claimed invention, including such features as controlling the temperature of the region forming the side wall of the vacuum processing chamber to the recited relatively low temperature, particularly together with the degree of plasma dissociation being in an intermediate degree, and with the microwaves utilized having a frequency from 300 MHz to

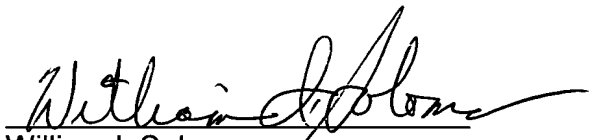
1GHz, wherein stable etching is achieved. That is, a change of etching characteristics with passage of time is suppressed.

The concurrently filed Information Disclosure Statement is noted. It is respectfully requested that the documents submitted therewith be considered during further examination of the above-identified application.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently pending in the above-identified application are respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (Case No. 520.37698CX1) and please credit any excess fees to such deposit account.

Respectfully submitted,



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Attachments